WHAT IS CLAIMED IS:

DORLOGIE DEDING

1	 A method for handling packets, comprising:
2	performing preliminary multi-protocol frame classification for incoming frames;
3	processing at least the incoming frame and the preliminary multi-protocol
4	frame classification to provide parsing instructions; and
5	providing multi-stage parsing of the incoming frame according to the parsing
6	instructions to generate search results presenting information about the incoming
7	frame.
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1	2. The method of claim 1 wherein the performing preliminary multi-
2	protocol frame classification further comprises resolving a composition for the
3	incoming frame.
1	3. The method of claim 1 wherein the processing further comprises:
2	storing an incoming frame in a memory buffer;
3	generating the parsing instructions for the incoming frame based upon the
4	multi-protocol frame classification; and
5	aligning the generated parsing instructions with frame data selected from the

incoming frames stored in the memory buffer.

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- 4. 1 The method of claim 1 wherein the providing multi-stage parsing of the 2 incoming frame further comprises: 3 reading at least a portion of the incoming frame from a memory buffer; 4 interpreting the parsing instructions; and 5 executing macros for performing parsing functions on at least the portion of 6 the incoming frame using the interpreted parsing instructions. 1 5. The method of claim 1 wherein the providing multi-stage parsing of the 2 incoming frame further comprises: 3 generating extractions instructions in response to the at least incoming frame 4
 - and the preliminary multi-protocol frame classification;
 using the extraction instructions to produce search queries; and
 applying the search queries against a memory to produce the search results.
 - 6. The method of claim 5 wherein the using the extraction instructions further comprises conditional extraction.
- 7. The method of claim 6 wherein conditional extraction comprises
 determining whether extracted bits of data from the packet meet a predetermined
 criteria.

8.	The method of claim 5 w	vherein the p	providing mu	ulti-stage pars	ing of the
incoming fra	me further comprises:				

- reprocessing the search results to generate refined parsing instructions; and parsing of the incoming frame according to the refined parsing instructions to generate refined search results, the refined search results providing greater information about the incoming frame.
- 9. The method of claim 1 wherein the providing multi-stage parsing of the incoming frame further comprises:
- reprocessing the search results to generate refined parsing instructions; and parsing of the incoming frame according to the refined parsing instructions to generate refined search results, the refined search results providing greater information about the incoming frame.
- 10. The method of claim 1 wherein the processing at least the incoming frame and the preliminary multi-protocol frame classification further comprises processing the search results, the incoming frame and the preliminary multi-protocol frame classification to provide refined parsing instructions.
- 1 11. The method of claim 1 wherein the parsing instructions comprise a
 2 location identifier and an associated instruction to be applied to the frame at the
 3 position identified by the location identifier.

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- 1 12. The method of claim 1 wherein the frame comprises one of a plurality 2 of frame protocols, the performing preliminary multi-protocol frame classification 3 further comprising classifying a protocol identity.
- 1 13. The method of claim 1 wherein the performing preliminary multi-2 protocol frame classification further comprises identifying each layer protocol and 3 writing the frame into memory along with a protocol layer code.
 - 14. The method of claim 13 wherein providing multi-stage parsing of the incoming frame further comprises using the protocol layer code as a start vector into an instruction memory, the instruction memory containing instructions for parsing the frame and pointers to access selected words of the frame in a frame buffer.
 - 15. The method of claim 14 wherein the performing preliminary multiprotocol frame classification further comprises identifying each layer protocol and
 writing the frame into memory along with a protocol layer code, the method further
 comprising processing the instructions from the instruction memory, resolving the
 pointers according to the protocol layer table and aligning the frame data with the
 instruction words.
- 1 16. The method of claim 14 wherein the search results are fed back to an 2 instruction controller to be used as data that a parsing engine can parse through a 3 data pipe.

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- 1 17. The method of claim 1 wherein the memory comprises a content
- 2 addressable memory and the search queries are used to search the content
- 3 addressable memory.
- 1 18. The method of claim 1 wherein the memory comprises a static random
- 2 access memory and the search queries are indexed directly to a static random
- 3 access memory.
- 1 19. The method of claim 1 further comprising providing a parser instruction set in the instruction memory to define microcode used for generating the parser instructions.
 - 20. The method of claim 1 further comprising forwarding the frame and the search results.
 - 21. The method of claim 1 wherein the search results include the frame classification.
- 1 22. The method of claim 16 wherein the search results are fed back to an 2 instruction controller to be used as a start vector for subsequent processing stages.
- 1 23. The method of claim 1 wherein providing multi-stage parsing of the 2 incoming frame further comprises performing conditional branching, the conditional 3 branching allowing specific instructions to be performed based upon satisfaction of a
- 4 predetermined criteria.

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1	24. A multi-protocol, multi-stage, real-time frame classifier, comprising:
2	a preliminary multi-protocol frame composition analyzer for performing
3	preliminary multi-protocol frame classification for incoming frames;
4	a parsing instruction generator for processing at least the incoming frame and
5	the preliminary multi-protocol frame classification to provide parsing instructions; and
6	a multi-stage parsing engine for providing multi-stage parsing of the incoming
7	frame according to the parsing instructions to generate search results presenting
8	information about the incoming frame.
1	25. The multi-protocol, multi-stage, real-time frame classifier of claim 24
2	wherein the preliminary multi-protocol frame classifier resolves a composition for the
3	incoming frame.
1	26. The multi-protocol, multi-stage, real-time frame classifier of claim 24
2	wherein the parsing instructions generator processing further comprises:
3	a memory buffer for storing an incoming frame;
4	an instruction generator for creating the parsing instructions for the incoming

frame based upon the multi-protocol frame classification; and

selected from the incoming frames stored in the frame buffer.

a data pipe for aligning the generated parsing instructions with frame data

- The multi-protocol, multi-stage, real-time frame classifier of claim 24
 wherein the multi-stage parsing engine reads at least a portion of the incoming
 frame from a memory buffer, interprets the parsing instructions, and executes
 macros for performing parsing functions on at least the portion of the incoming frame
 using the interpreted parsing instructions.
 - 28. The multi-protocol, multi-stage, real-time frame classifier of claim 24 wherein the multi-stage parsing engine generates extraction instructions in response to the at least incoming frame and the preliminary multi-protocol frame classification.
 - 29. The multi-protocol, multi-stage, real-time frame classifier of claim 28 · wherein the multi-stage parsing engine performs conditional extractions using the extraction instructions.
 - 30. The multi-protocol, multi-stage, real-time frame classifier of claim 29 wherein conditional extraction comprises determining whether extracted bits of data from the packet meet a predetermined criteria.
 - 31. The multi-protocol, multi-stage, real-time frame classifier of claim 28 wherein the multi-stage parsing engine further comprises an extractor for using the extraction instructions to produce search queries and a memory for applying the search queries against to produce the search results.

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- The multi-protocol, multi-stage, real-time frame classifier of claim 31
 further comprising a feedback path for allowing the search results to be reprocessed
 to generate refined parsing instructions that are used by the parsing engine to
 generate refined search results, the refined search results providing greater
 information about the incoming frame.
 - 33. The multi-protocol, multi-stage, real-time frame classifier of claim 24 wherein the parsing instructions generator processes the search results, the incoming frame and the preliminary multi-protocol frame classification to provide refined parsing instructions.
 - 34. The multi-protocol, multi-stage, real-time frame classifier of claim 24 wherein the parsing instructions comprise a location identifier and an associated instruction to be applied to the frame at the position identified by the location identifier.
 - 35. The multi-protocol, multi-stage, real-time frame classifier of claim 24 wherein the frame comprises one of a plurality of frame protocols, the preliminary multi-protocol frame classifier classifying the incoming frame to identify a protocol identity.
- The multi-protocol, multi-stage, real-time frame classifier of claim 24 wherein the preliminary multi-protocol frame classifier identifies each layer protocol and writes the frame into memory along with a protocol layer code.

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- The multi-protocol, multi-stage, real-time frame classifier of claim 36 1 37. wherein the multi-stage parsing engine uses the protocol layer code as a start vector 2 for an instruction memory, the instruction memory containing instructions for parsing 3 the frame and pointers to access selected words of the frame in a memory buffer. 4
 - The multi-protocol, multi-stage, real-time frame classifier of claim 37 38. wherein the parsing instructions generator identifies each layer protocol and writes the frame into memory along with a protocol layer code and wherein the multi-stage parsing engine processes the instructions from the instruction memory, resolves the pointers according to the protocol layer table and aligns the frame data with the instruction words.
 - 39. The multi-protocol, multi-stage, real-time frame classifier of claim 37 wherein the search results are fed back to the parsing instructions generator to be used as data that a parsing engine can parse through a data pipe.
 - 40. The multi-protocol, multi-stage, real-time frame classifier of claim 24 wherein the memory comprises a content addressable memory and the search queries are used to search the content addressable memory.
- 41. The multi-protocol, multi-stage, real-time frame classifier of claim 24 2 wherein the memory comprises a static random access memory and the search 3 queries are indexed directly to a static random access memory.

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- 1 42. The multi-protocol, multi-stage, real-time frame classifier of claim 24 2 wherein the parsing instructions generator provides a parser instruction set in an 3 instruction memory to define microcode used for generating the parser instructions.
- 43. The multi-protocol, multi-stage, real-time frame classifier of claim 24 2 wherein the multi-stage parsing engine forwards the frame and the search results.
- 1 44. The multi-protocol, multi-stage, real-time frame classifier of claim 24 2 wherein the search results include the frame classification.
 - 45. The multi-protocol, multi-stage, real-time frame classifier of claim 39 wherein the parsing instructions generator further comprises an instruction controller and wherein the search results are fed back to the instruction controller to be used as a start vector for subsequent processing stages.
 - 46. The multi-protocol, multi-stage, real-time frame classifier of claim 24 wherein the multi-stage parsing engine performs conditional branching, the conditional branching allowing specific instructions to be performed based upon satisfaction of a predetermined criteria.

incoming frames stored in the memory buffer.

1	47. An article of manufacture comprising a program storage medium
2	readable by a computer, the medium tangibly embodying one or more programs of
3	instructions executable by the computer to perform a method for parsing frames in a
4	network flow, the method comprising:
5	performing preliminary multi-protocol frame classification for incoming frames
6	processing at least the incoming frame and the preliminary multi-protocol
7	frame classification to provide parsing instructions; and
8	providing multi-stage parsing of the incoming frame according to the parsing
9	instructions to generate search results presenting information about the incoming
10	frame.
. 1	48. The article of manufacture of claim 47 wherein the performing
2	preliminary multi-protocol frame classification further comprises resolving a
3	composition for the incoming frame.
. 1	49. The article of manufacture of claim 47 wherein the processing further
2	comprises:
3	storing an incoming frame in a memory buffer;
4	generating the parsing instructions for the incoming frame based upon the
5	multi-protocol frame classification; and
6	aligning the generated parsing instructions with frame data selected from the

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predetermined criteria.

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1	50. The article of manufacture of claim 47 wherein the providing multi-
2	stage parsing of the incoming frame further comprises:
3	reading at least a portion of the incoming frame from a memory buffer;
4	interpreting the parsing instructions; and.
5	executing macros for performing parsing functions on at least the portion of
6	the incoming frame using the interpreted parsing instructions.
1	51. The article of manufacture of claim 47 wherein the providing multi-
2	stage parsing of the incoming frame further comprises:
3	generating extractions instructions in response to the at least incoming frame
4	and the preliminary multi-protocol frame classification;
5	using the extraction instructions to produce search queries; and
6	applying the search queries against a memory to produce the search results.
1	52. The article of manufacture of claim 51 wherein the using the extraction
2	instructions further comprises conditional extraction.
1	53. The article of manufacture of claim 52 wherein conditional extraction

comprises determining whether extracted bits of data from the packet meet a

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- 54. The article of manufacture of claim 51 wherein the providing multistage parsing of the incoming frame further comprises:
 reprocessing the search results to generate refined parsing instructions; and
 parsing of the incoming frame according to the refined parsing instructions to
 generate refined search results, the refined search results providing greater
 information about the incoming frame.
 - 55. The article of manufacture of claim 47 wherein the providing multistage parsing of the incoming frame further comprises:
 - reprocessing the search results to generate refined parsing instructions; and parsing of the incoming frame according to the refined parsing instructions to generate refined search results, the refined search results providing greater information about the incoming frame.
 - 56. The article of manufacture of claim 47 wherein the processing at least the incoming frame and the preliminary multi-protocol frame classification further comprises processing the search results, the incoming frame and the preliminary multi-protocol frame classification to provide refined parsing instructions.
- The article of manufacture of claim 47 wherein the parsing instructions comprise a location identifier and an associated instruction to be applied to the frame at the position identified by the location identifier.

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- 1 58. The article of manufacture of claim 47 wherein the frame comprises 2 one of a plurality of frame protocols, the performing preliminary multi-protocol frame 3 classification further comprising classifying a protocol identity.
- 1 59. The article of manufacture of claim 47 wherein the performing 2 preliminary multi-protocol frame classification further comprises identifying each 3 layer protocol and writing the frame into memory along with a protocol layer code.
 - 60. The article of manufacture of claim 59 wherein providing multi-stage parsing of the incoming frame further comprises using the protocol layer code as a start vector into an instruction memory, the instruction memory containing instructions for parsing the frame and pointers to access selected words of the frame in a memory buffer.
 - 61. The article of manufacture of claim 60 wherein the performing preliminary multi-protocol frame classification further comprises identifying each layer protocol and writing the frame into memory along with a protocol layer code, the method further comprising processing the instructions from the instruction memory, resolving the pointers according to the protocol layer table and aligning the frame data with the instruction words.
 - 62. The article of manufacture of claim 60 wherein the search results are fed back to an instruction controller to be used as data that a parsing engine can parse through a data pipe.

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content addressable memory.

- 1 63. The article of manufacture of claim 47 wherein the memory comprises 2 a content addressable memory and the search queries are used to search the
- 1 64. The article of manufacture of claim 47 wherein the memory comprises 2 a static random access memory and the search queries are indexed directly to a 3 static random access memory.
 - 65. The article of manufacture of claim 47 further comprising providing a parser instruction set in the instruction memory to define microcode used for generating the parser instructions.
 - 66. The article of manufacture of claim 47 further comprising forwarding the frame and the search results.
 - 67. The article of manufacture of claim 47 wherein the search results include the frame classification.
- 1 68. The article of manufacture of claim 62 wherein the search results are 2 fed back to an instruction controller to be used as a start vector for subsequent 3 processing stages.
- 1 69. The article of manufacture of claim 47 wherein providing multi-stage 2 parsing of the incoming frame further comprises performing conditional branching, 3 the conditional branching allowing specific instructions to be performed based upon 4 satisfaction of a predetermined criteria.

1	70. A method for handling packets, comprising:
2	performing preliminary multi-protocol frame classification for incoming frames;
3	processing at least the incoming frame and the preliminary multi-protocol
4	frame classification to provide parsing instructions; and
5	providing parsing of the incoming frame according to the parsing instructions
6	to generate search results presenting information about the incoming frame.
1	71. A method for handling packets, comprising:
2	processing at least the incoming frame to provide parsing instructions; and
3	providing multi-stage parsing of the incoming frame according to the parsing
4	instructions to generate search results presenting information about the incoming
5	frame.
1	72. An article of manufacture comprising a program storage medium
2	readable by a computer, the medium tangibly embodying one or more programs of
3	instructions executable by the computer to perform a method for parsing frames in a
4	network flow, the method comprising:
5	performing preliminary multi-protocol frame classification for incoming frames
6	processing at least the incoming frame and the preliminary multi-protocol
7	frame classification to provide parsing instructions; and
8	providing parsing of the incoming frame according to the parsing instructions

to generate search results presenting information about the incoming frame.

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frame.

1	73. An article of manufacture comprising a program storage medium
2	readable by a computer, the medium tangibly embodying one or more programs of
3	instructions executable by the computer to perform a method for parsing frames in a
4	network flow, the method comprising:
5	processing at least the incoming frame to provide parsing instructions; and
6	providing multi-stage parsing of the incoming frame according to the parsing
7	instructions to generate search results presenting information about the incoming

74. A multi-protocol, multi-stage, real-time frame classifier, comprising: a preliminary multi-protocol frame composition analyzer for performing preliminary multi-protocol frame classification for incoming frames;

a parsing instruction generator for processing at least the incoming frame and the preliminary multi-protocol frame classification to provide parsing instructions; and a parsing engine for providing multi-stage parsing of the incoming frame according to the parsing instructions to generate search results presenting information about the incoming frame.

a parsing instruction generator for processing an incoming frame to provide parsing instructions; and a multi-stage parsing engine for providing multi-stage parsing of the incoming frame according to the parsing instructions to generate search results presenting information about the incoming frame.

A multi-protocol, multi-stage, real-time frame classifier, comprising: